

NOTES ON THE APPLICATION OF UPPER-AIR OBSERVATIONS TO WEATHER FORECASTING, FEBRUARY, 1912.

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In the notes for January, 1912, it was pointed out that the wind on the western border of an anticyclone, possibly coupled with the temperature conditions, seemed to foreshadow the course of cyclonic movement when the center of the cyclone is situated in the southwest. The upper-air conditions during February, 1912, were watched closely for additional evidence on the point in question, whether favorable or unfavorable.

An approximation to the pressure distribution which prevailed in the January case appeared on February 24, 1912, with this important difference, viz, while the position and intensity of the eastern anticyclone was quite similar to the January cases and the same high winds and relatively high temperatures were observed aloft as in the previous cases, the position of the cyclonic depression was about 1,500 kilometers (932 miles), farther west than on previous occasions. The conditions were still further involved by the presence in the Gulf States and the middle and lower Mississippi Valley of a region of falling pressure and precipitation, that is, pressure was falling and precipitation was occurring at the time of the kite flight at Mount Weather. The latter showed at 3,326 meters (10,912 feet) above sea level the prevalence of southwest winds having a velocity of 57 miles per hour (26 meters p. s.). The temperature at the same altitude was 1° C. lower than at the surface. In other words, temperature was relatively high aloft. In these two particulars, viz, high southwest winds and high temperatures aloft, the case of February 24, 1912, agrees with those already reported on. It seems from the evidence thus far adduced that under like conditions of pressure distribution similar phenomena, especially of wind recur; thus the high winds and relatively high temperatures of which we have been speaking seem to be clearly the result of the pressure distribution in time and space. More precisely, they occur when this station is on the western border of an anticyclone that is retreating over the ocean to the eastward. Frequently a pressure distribution of this character includes a cyclonic disturbance to the southwest, but in the case of February 24 the center of the cyclone was so far removed from Mount Weather as to exert no influence on the weather experienced at the latter station. Instead of a cyclonic disturbance to the west or southwest we have to do with a fall of pressure in the Gulf States and the lower Mississippi Valley which advanced during the ensuing 24 hours over Mount Weather. These pressure falls—the isallobars of Dr. Ekholm—sometimes advance from west to east without greatly distorting the existing isobars or producing a system of closed isobars and the wind circulation which belongs thereto. The upper air, as well as the surface observations, on the 24th clearly indicated the coming of falling weather at Mount Weather. The upper-air observations of the next day, February 25, are full of interest. During the preceding 24 hours the

wave of falling pressure before referred to passed over Mount Weather and evidently so altered the pressure distribution that instead of southwest winds now west-northwest winds prevailed up to an altitude of $2\frac{1}{2}$ miles (4,000 meters).

In the meantime the cyclonic depression of the 24th had advanced from Arizona to within what we may call "striking" distance of Mount Weather, that is to say, under favorable conditions of movement Mount Weather would be within its sphere of influence in 24 hours, and this fact makes the upper-air observations of the greater interest. Fortunately, as before stated, the kites reached an altitude on the 25th of $2\frac{1}{2}$ miles (4,000 meters) at which level the winds were from the west-northwest and the velocity was 68 miles per hour (30 meters p. s.). There was no temperature inversion, the vertical decrease per 100 meters being 0.43° C. On the theory that storms are carried along in the general drift of the atmosphere, much as eddies in a stream of water, it is a fair inference that, did the upper wind observed at Mount Weather prevail to the westward, say to the margin of the ridge of high pressure in which it was observed, then the course of the cyclone would have been diverted to the eastward. On the contrary, the latter increased in intensity and traveled almost due northeast, a direction practically athwart the course of the strong, west-northwest winds in the $2\frac{1}{2}$ -mile level above sea and over Mount Weather. Coincidentally with the northeastward movement of the cyclone, so far as we can tell, the winds in the free air above Mount Weather went to south, the flight on the 26th showing winds from that direction up to 1,863 meters (6,112 feet), the top of the flight. Considering only the single case here reported, it would seem clear, first, that a single station can give little information as to the extent of horizontal air currents, and, second, that such currents, at least under 3 miles (5 kilometers), are exceedingly fleeting in character, rarely holding true in both direction and speed for more than 24 hours.

The upper winds at Mount Weather during February, 1912, were not conducive to kiteflying, since on only 10 days was a flight of a mile or more above the station obtained, and only two of these came on consecutive days. Another peculiarity of the month was the very small velocities of the easterly and southerly winds in front of cyclones approaching from the west and southwest. This peculiarity is well illustrated by the conditions which obtained on the 21st. On that date there was a cyclone centered over western Kentucky, with lowest pressure 29.15 inches (740 millimeters), and the station at Mount Weather was well within the system of circulating winds and closed isobars, yet there was not enough surface wind to get the kites into the air. On four other days sufficient winds to fly kites were not present, and on three additional days the winds were so strong that the kites broke away.